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Cyborg cells: Functionalisation of living cells with polymers and nanomaterials

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Abstract

Living cells interfaced with a range of polyelectrolyte coatings, magnetic and noble metal nanoparticles, hard mineral shells and other complex nanomaterials can perform functions often completely different from their original specialisation. Such "cyborg cells" are already finding a range of novel applications in areas like whole cell biosensors, bioelectronics, toxicity microscreening, tissue engineering, cell implant protection and bioanalytical chemistry. In this tutorial review, we describe the development of novel methods for functionalisation of cells with polymers and nanoparticles and comment on future advances in this technology in the light of other literature approaches. We review recent studies on the cell viability and function upon direct deposition of nanoparticles, coating with polyelectrolytes, polymer assisted assembly of nanomaterials and hard shells on the cell surface. The cell toxicity issues are considered for many practical applications in terms of possible adverse effects of the deposited polymers, polyelectrolytes and nanoparticles on the cell surface. © 2012 The Royal Society of Chemistry.

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